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(71) Applicant
Hampshire Advisory and Technical Services Ltd

(Incorporated in the United Kingdom)

39 South View Road, Upper Shirley, Southampton,
SO1 5JD, United Kingdom

(72) Inventor
Dr Philip Monro

(74) Agent and/or Address for Service
David W Bradley
359 Walsgrave Road, Stoke, Coventry, CV2 4BG,
United Kingdom

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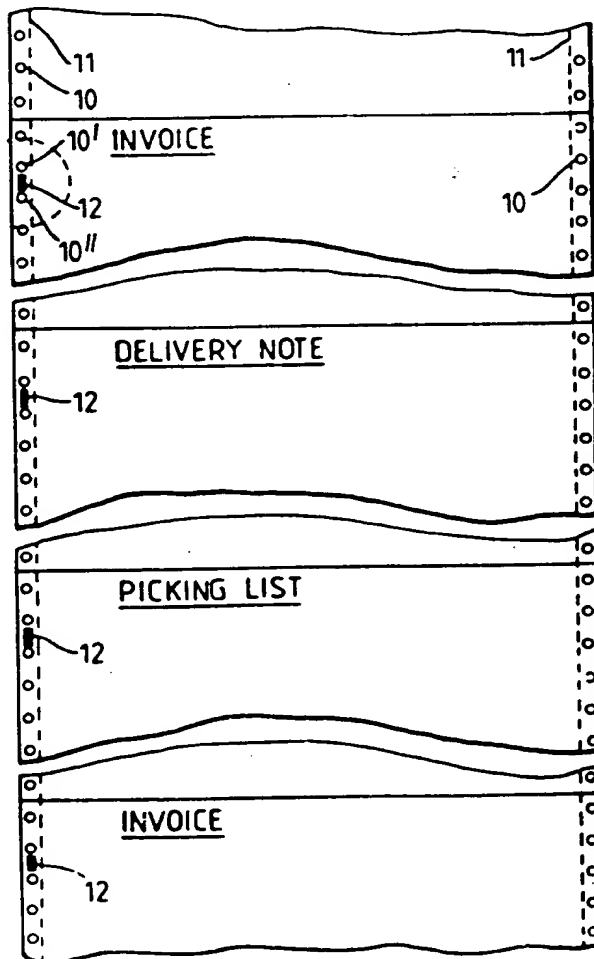GB 2035902 A   US 4541337 A   US 4477103 A

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UK CL (Edition J) B6C CWTF, B6F FAC FAG FAH
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(54) **Control of content and format in accordance with identity of substrate in selective printing**

(57) A selective printer for filling in preprinted forms is controlled in association with a sensor which detects coded marks on the form stock, the format and content of the selectively printed matter being adapted to the nature of the selected form.

As described (Fig 3) the form stock may include a variety of different successive forms, each identified by a code mark (12). In use, the printer may search for the particular form required for an item; print the item in the format dictated by the form; and then cancel the code mark on the filled form. The invention enables a plurality of different but related documents to be prepared in respect of a transaction without the necessity of either a plurality of machines or a change of form stock.

Fig. 3.

GB 2 227 718 A

Fig. 1.

```
        ⌐1                              ⌐4
┌─────────────────┐          ┌─────────────────────┐
│                 │  ◄───►   │      PRINTER        │
│      DATA       │  ◄─────  │                     │
│   PROCESSOR     │  ─────►  ├─────────────────────┤
│                 │          │      DETECTOR       │
└─────────────────┘          └─────────────────────┘
    │         │                              ⌐5
    │         │
    │    2    │    3
┌────────┐ ┌──────────┐
│KEYBOARD│ │ DISPLAY  │
└────────┘ └──────────┘
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Fig. 2.

```
                                              ⌐4
        ⌐5                ⌐6                          ⌐9
┌──────────────┐   ┌──────────────┐       ┌──────────────┐
│    CODE      │   │  PRINTHEAD   │       │    PAPER     │
│  DETECTOR    │   │              │       │  DETECTOR    │
└──────────────┘   └──────────────┘       └──────────────┘
  Ⓐ───►    │ │ │          │              Ⓐ◄──┐  │
           │ │ │          │                   │  │
           │ │ │     ┌──────────────┐         │  │
           │ │ │     │ PRINTER DATA │⌐8       │  │
           │ │ │     │   BUFFER     │◄────────┼──┘
           │ │ │     └──────────────┘         │
           │ │ │                              │      TO DATA
           │ │ └──────────────────────────────┤      PROC. 1
           │ └────────────────────────────────┤
           │                                  │
    ┌──────────────┐
    │   TRACTOR    │⌐7
    │    DRIVE     │
    └──────────────┘
```

Fig. 3.

INVOICE

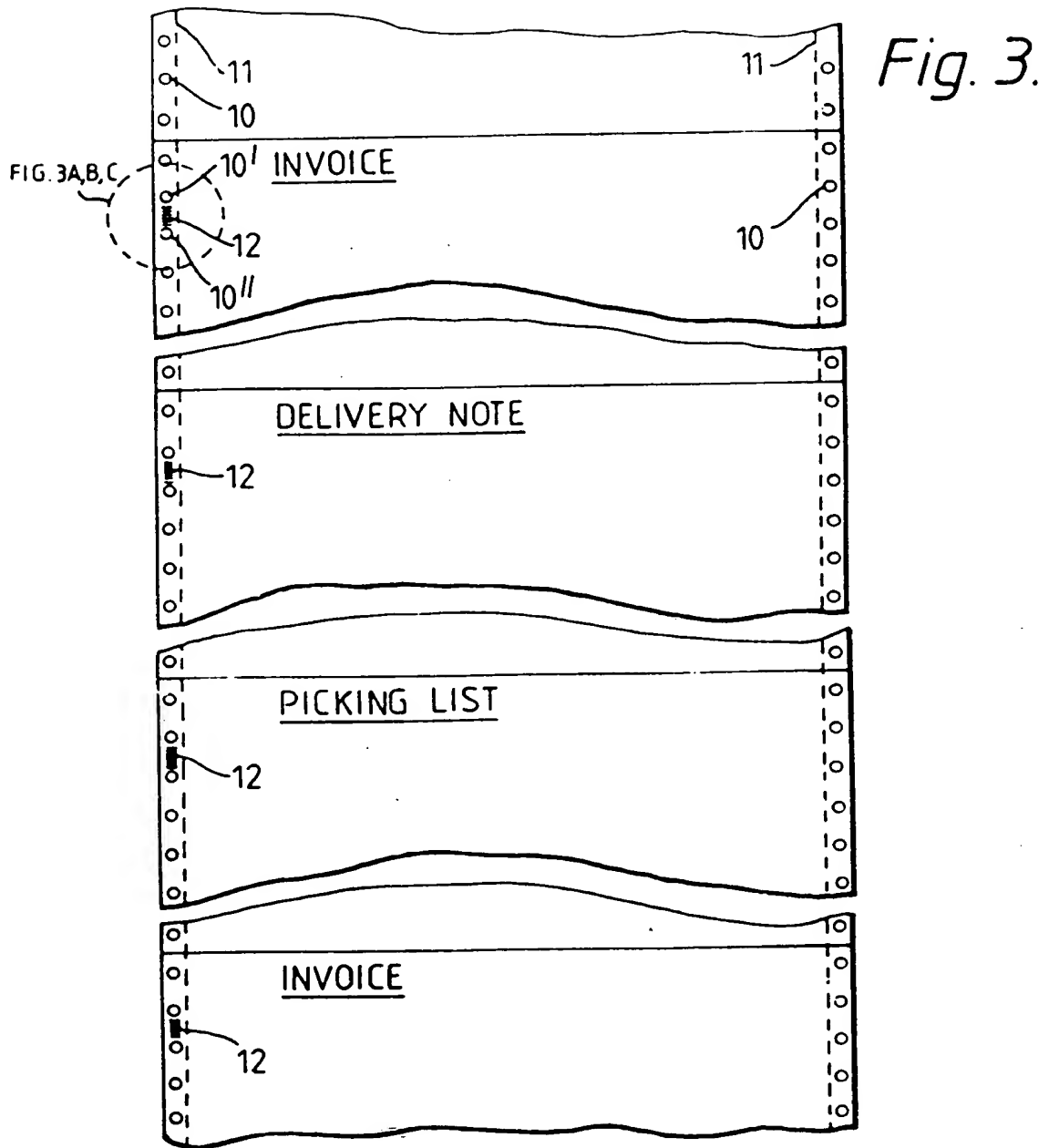FIG. 3A,B,C

DELIVERY NOTE
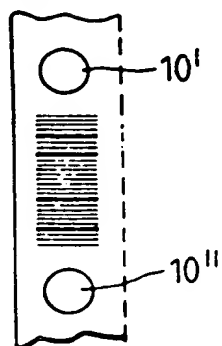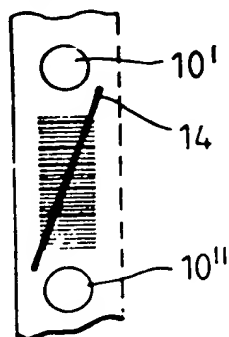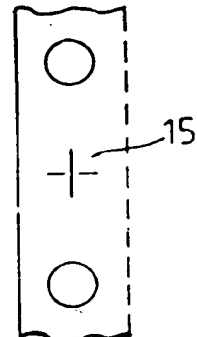
PICKING LIST

INVOICE
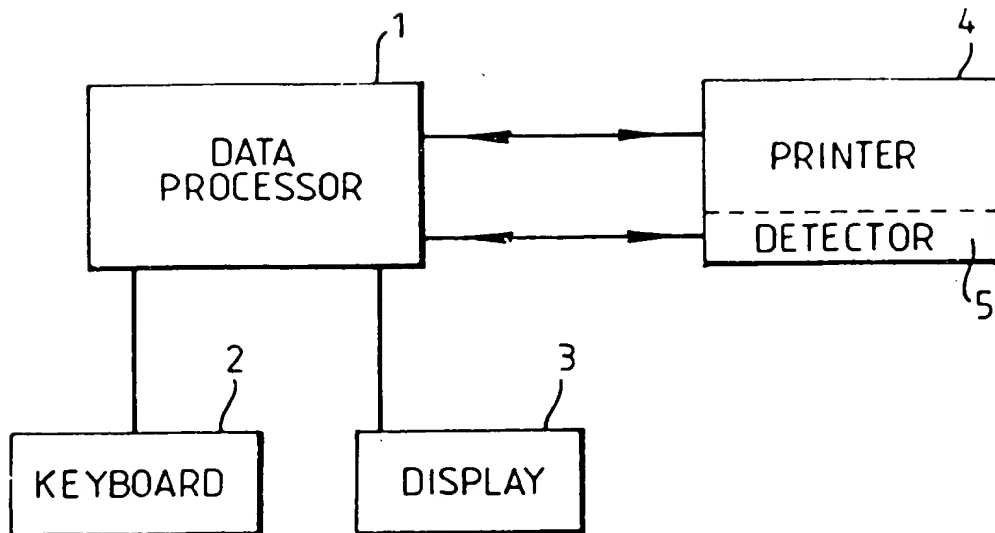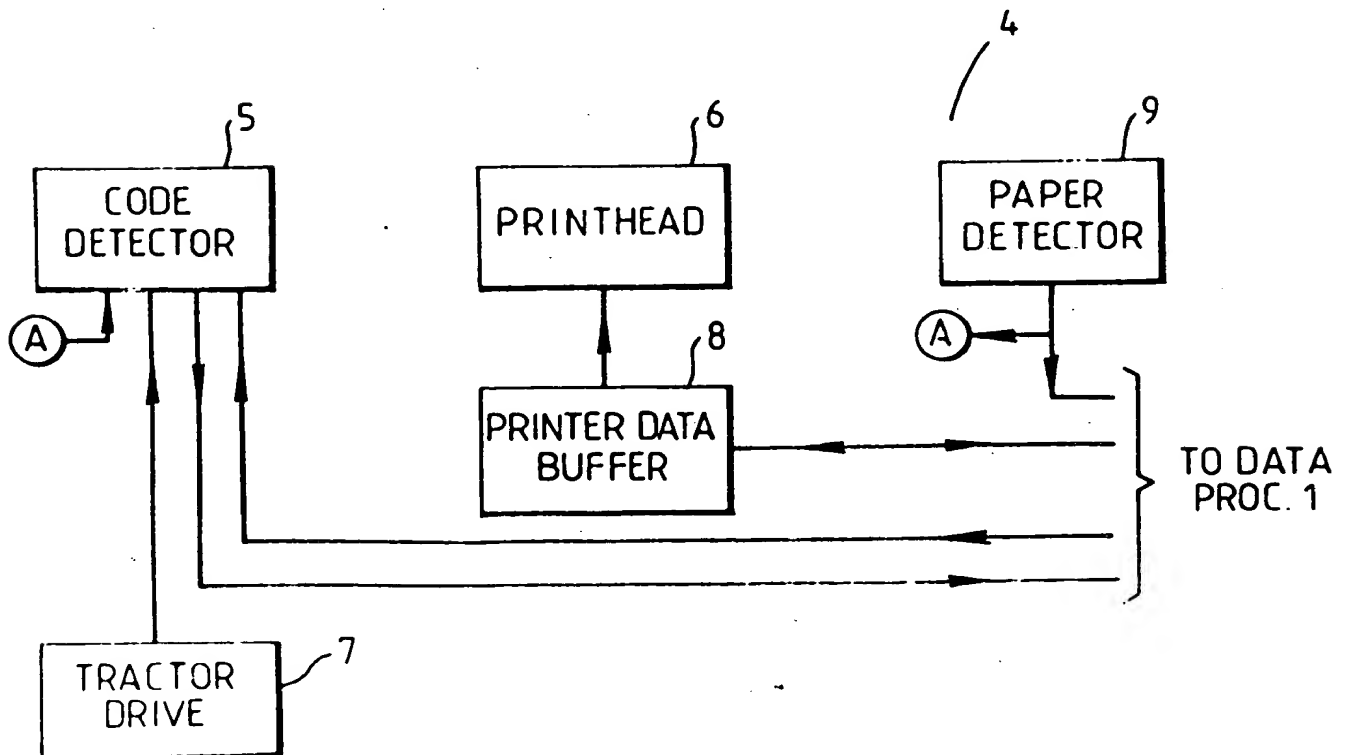
Fig. 3A

Fig. 3B

Fig. 3C

Computer Output Device and Paper Therefor

The present invention relates to a computer output device and more particularly to a computer output device including paper detection means.

In our co-pending United Kingdom Patent Applications Nos. 8826860 and 8826884 filed on 17th November 1988 are disclosed methods and apparatus to facilitate entry of text details to word processing apparatus such that on output to a printer the text detail correctly registers with spaces for completion on pre-printed forms. In using the inventions noted above, it is necessary for the operator to ensure consistent alignment of the forms to be printed when inserted in the printer. With certain types of printer, such alignment may require manual intervention.

Such alignment problems do not necessarily occur when using "continuous" stationery of the kind having edges including regularly spaced apertures arranged to co-operate with spigots of a continuous belt drive to feed the paper past a print head of a printer. However, any variation of the paper length set in a data file of the computer apparatus in use and the paper being used may result in incorrect positioning of the printed output with respect to individual sheets of the continuous stationery.

Having considered the problem of alignment of paper with a computer output device, correct alignment of stationery will not assist if the wrong stationery has been placed in a printer which may be remote from the operator's location. For example, if the operator has input details for completion of several different forms, it will be necessary for each such form (or a continuous stationery set for each such form) to be inserted in a printer prior to output of its associated data file. Either multiple printers each having a respective form type inserted therein must be provided or the operator must change the form type manually. Thus either significant capital expenditure is required or considerable operator time may be involved.

Furthermore, if multiple printers are provided, forms associated with a particular set of data files may need to be collated requiring careful manual sorting.

One object of the present invention is to provide a computer output device and stationery therefor adapted to overcome the above problems.

According to the present invention, there is provided a computer output device wherein detector means is responsive to a pre-determined pattern provided on input material to cause signals characterising the pattern to be sent to a data processor, the data processor being responsive to the signals to cause output of an appropriate data file or to inhibit output of an incorrect data file such that data created for completion of a form of one kind is not inadvertently overprinted on a form of a differing kind.

Preferably, the detector means is also responsive to the location of the pre-determined pattern to cause alignment of the input material with respect to a print head of the device whereby pre-printed forms are located to ensure correct register of in-fill data with respect to pre-determined locations on the forms.

The detector means may be responsive to signals from a data processor to cause it to search for a particular pattern, the detector means causing drive means to feed input material past the printhead until the particular pattern is detected.

The computer output device may include means to cause cancellation of the pattern on selecting input material associated with that pattern for completion. The detector means may be arranged to cause the drive means to feed input material in either a forward or a backward direction and may be arranged to cause a search in a backward direction for a cancelled pattern and then in a forward direction for the first non-cancelled occurrence of the selected pattern.

The pattern is preferably a numerical coding pattern and may include a number identifying a form type and a number identifying a set number within a series of sets of forms of differing type.

The pattern may be printed on the input material or may be provided as a series of aperture positions on the input material, the pattern being provided in binary form by punching selected ones of the aperture positions.

According to a feature of the present invention, there is provided a computer output device comprising detector means to detect a pre-determined pattern provided on input material and means responsive to data input from a data processor to align such input material with respect to a printing head of the device whereby data output by the data processor is correctly registered with a page to be printed without operator intervention.

Preferably, the pattern comprises a location mark.

According to a second aspect of the present invention, there is provided input material for a computer output device, the input material carrying a pattern detectable by the device, the pattern characterising an identifier which determines data to be printed on the material.

Preferably, the input material comprises a pre-printed form, the pattern being arranged to identify the type of form uniquely.

The pattern may be printed and may comprise a numerical bar code which may include information identifying the type of form and a set number within a series of sets.

Alternatively, the pattern may be provided as a series of aperture positions on the material the presence or absence of which determine the pattern.

A second feature of the invention provides input material for a computer output device, the input material carrying a pattern detectable by such a device, the pattern comprising a location mark.

A computer output device and stationery for use therewith will now be described by way of example only with reference to the accompanying drawings of which:-

Figure 1   is a block schematic diagram of word processing apparatus including a computer output device in accordance with the invention;

Figure 2   is a simplified block schematic diagram of the printer of figure 1;   and

Figure 3   is a schematic diagram of a series of sets of
forms   on continuous paper for use with the
printer of Figure 1.

Referring first to figure 1, a typical word processing
apparatus comprises a data processor 1 programmed to
provide a word processing application, a keyboard 2 and a
display screen 3 each connected to respective ports of the
data processor 1.

A further port of the data processor 1 is connected to a
printer 4 by way of a multi-pin connector for parallel
input/output functions.   As thus far described, the
apparatus of figure 1 is common to many word processing
installations some of which may include multiple
workstations each comprising a respective keybard 2 and
display 3. Many such installations will also include
several printers 4 and other computer output peripherals
such as graphics printers, plotters and the like (not
shown).

In the present invention, the printer 4 is modified by the
inclusion of a detector 5 which uses spare connections of
the multi pin connector (or in the case of serial output
ports spare data channels) to receive instruction signals
from or return information signals to the data processor
1.

Thus, referring now to figure 2, the detector 5 is
arranged to scan the reverse of a single sheet of paper
where the printer 4 is of the kind including a sheet
feeder or is arranged to scan the margin of "continuous"
paper where the printer 4 is of the kind having a tractor
drive 7.

For the purposes of description, we shall consider the
invention primarily in relation to continuous paper of the
kind having a series of apertures adapted to co-operate
with spigots arranged on a continuous belt or driven
pulley to feed the paper past the printhead 6 of the
printer 4. However, it is here noted that the invention
applies to other input materials such as plastics coated
and plastics form materials. Adaptations of the detector
and printer to apply the invention to other paper types
such as single sheets and fan folded papers will be
readily apparent.

Referring now also to figure 3, in one method of
operation, when the processor 1 has assembled a data file
for printing, it is arranged to cause a signal to be sent
to the detector 5 requesting a form identity. The detector
5 causes the tractor drive 7 to cause the paper to advance
towards the print head 6 thus causing a bar code to pass
under the code detector head.

The detector 5 now causes signals to be returned to the data processor 1 characterising the code which has been read. Two modes of operation of the data processor in response to signals generated by this method of operation are now possible. In a first mode, the processor 1 is programmed to compare the received code with a pre-determined code - that is a code previously entered by the operator. If a difference is detected then the processor simply causes a message to be displayed such as "wrong form in printer" thus alerting the operator to change the form(s) held in the printer.

If the two codes are compatible, then the processor 1 causes the relevant data to be forwarded to the printer data buffer 8 for printing.

In an alternative mode of operation, the data processor 1 causes an appropriate file to be accessed (where several different files may have been created) so that appropriate data is output for the completion of the form now present at the print head 6.

Before considering a second method of operating the data processor 1 and detector 5 combination, reference is made to figure 3 which shows a part of a typical continuous stationery form set comprising invoices, delivery notes and warehouse picking lists. As with most such continuous stationery, the paper has regularly spaced apertures 10 seperable from the main paper sheet by perforated sections 11.

Each sheet of the stationery stack has printed in the margin between two of the apertures 10', 10" a numerical bar code 12 which is related to the form pre-printed on the associated sheet.

Referring again also to Figure 2, in the second method of operation, the data processor 1 forwards data to the detector 5 identifying the particular type of form (say an invoice form) for which its current output file is complete.

The code detector 5 now causes the tractor drive 7 to drive in a reverse direction until either a paper detector 9 of the printer 6 causes a "paper out" signal or the code detector 5 locates a cancelled bar code corresponding to a completed invoice form.

Once one of the above two events occurs, the detector 5 causes the tractor drive 7 to drive in a forward direction until the first occurence of a non-cancelled bar code corresponding to an invoice is located.

Thus, even if several forms of one type are completed before forms of another type, the detector will locate the first unused form in the current stack of forms.

Figure 3A shows a typical bar code 12 while figure 3B shows a typical cancelled bar code. To cancel a bar code, on selection of a form to be completed, which is signalled to the data processor as having been located, the detector causes the mark 12 to be overprinted by a diagonal bar. Thus on searching for a cancelled bar code of a particular type, the detector circuitry needs to search only for diagonal bars in the first instance and may then consider the underlying pattern 12.

It will be appreciated that in addition to identifying the form type, the bar code 12 may include (e.g.) a set number such that if the processor 1 requires sets of documents to be produced it may cause signals identifying a set and a form number to be sent to the detector 5, the detector 5 searching for that specific set and form. This enables, say, all of the invoices for a number of customers to be generated followed by, say, all of the delivery notes and all of the picking lists so that the documents of each set remain associated with each other.

A further function of the mark 12 is to facilitate alignment of the forms with the printhead 6. Thus by arranging for the "start" bars of a bar code 12 to be printed at the same time as the associated form, the detector 5 may determine the position of the form with respect to the printhead 6. Thus the detector 5 can cause the tractor drive 7 to move to a position at which the start bars are at a predetermined position with respect to the detector 5 thus effectively registering the form with respect to the print head 6.

The detector 5 may include an optical bar code reader for example in which case the code marks 12 may be printed using any suitable ink to provide contrast. Alternatively, a magnetically sensitive detector may be provided in which case the marks 12 are printed using a magnetically sensitised ink.

A simpler printer modification is required if only paper alignment is required. Thus as shown in figure 3C, a simple alignment mark 15 may be printed on the form. A simple detector is arranged to scan for the alignment mark and cause the tractor drive 7 to locate the paper with respect to the print head 6.

With sheet fed forms, the form may include a bar code in any suitable position but for presentation reasons marks printed on the reverse of a form may be preferred.

It will be realised that while as hereinbefore described the detector controls such functions as tractor drive and searching, the detector may be arranged simply to scan the bar codes 12 and signal the codes read to the data processor 1. Control functions to effect tractor drive and the like may be a function of the data processor output program thus eliminating the need for "intelligence", such as a microprocessor for example, to be included in the circuitry associated with the detector 5.

It will be noted that while as herein described the bar code 12 has a vertical orientation, other orientations, particularly a horizontal disposition of the bar code may be used.

As an alternative to a bar code, a code printed in computer and humanly readable form may be employed similar to codings of a kind similar to those used on bank cheques and deposit documents.

In an alternative method of implementing the invention (not shown), the bar code 12 is replaced by a series of aperture positions additional to the apertures 11 provided fpr tractor drives, the code being of binary form with one binary state represented by presence of an aperture at the aperture position and the other binary state being represented by absence of an aperture. It will also be realised that the alignment mark may consist of a single aperture specifically located with respect to the page divisions within the continuous paper stack.

It should also be noted that although the invention has been described with reference to a set of forms, other mixed continuous stationery sets may be used. For example, it is possible to attach tractor drive edges to materials such as letterheads, continuation sheets and envelopes. Accordingly an identifiable set of sheets and envelopes may be provided in a single stack of continuous stationery.

Claims

1.   A computer output device wherein detector means is responsive to a pre-determined pattern provided on input material to cause signals characterising the pattern to be sent to a data processor, the data processor being responsive to the signals to cause output of an appropriate data file or to inhibit output of an incorrect data file such that data created for completion of a form of one kind is not inadvertently overprinted on a form of a differing kind.

2.   A computer output device as claimed in claim 1 wherein the detector means is also responsive to the location of the pre-determined pattern to cause alignment of the input material with respect to a print head of the device whereby pre-printed forms are located to ensure correct register of in-fill data with respect to pre-determined locations on the forms.

3.   A computer output device as claimed in claim 1 or claim 2 wherein the detector means is also responsive to signals from a data processor to search for a particular pattern, drive means of the device being caused to feed input material past the print head until the particular pattern is detected.

4.   A computer output device as claimed in claim 3 wherein cancellation means is arranged to cause cancellation of the pattern on selecting input material associated with that particular pattern for completion.

5.   A computer output device as claimed in claim 3 or claim 4 wherein the drive means is caused to feed input material past the printhead in either a forward or a backward direction.

6.   A computer output device as claimed in claim 5 when
dependent on claim 4 wherein the drive means is
caused to feed input material in a backward direction
until either the start of a series of sheets of input
material is located or a cancelled pattern is
located, the drive means then being caused to feed
input material in a forward direction until the first
occurence of the selected pattern is detected.

7.   A computer output device as claimed in any preceding
claim wherein the detector means is responsive to a
pattern representing a numerical coding.

8.   A computer output device as claimed in any preceding
claim wherein the detector means is responsive to a
pattern printed on the input material.

9.   A computer output device as claimed in claim 8 wherein
the detector means is responsive to a bar code
depicting a numerical coding.

10.   A computer output device as claimed in any one of
claims 1 to 7 wherein the detector means is responsive
to a pattern formed by providing selected apertures in
a series of aperture positions provided in the input
material.

11.   A computer output device as claimed in any preceding
claim wherein the detector means is an optical
detector.

12.   A computer output device as claimed in any one of
claims 1 to 9 wherein the detector means is a
magnetic detector.

13.   A computer output device comprising detector means to
detect a pre-determined pattern provided on input
material and means responsive to data input from a
data processor to align such input material with
respect to a print head of the device whereby data
output by the data processor is correctly registered
with a page to be printed without operator
intervention.

14.   A computer output device as claimed in claim   13
wherein the pattern comprises a location mark.

15.   A computer output device as claimed in claim 13 or claim 14 wherein the detector means is responsive to a pattern printed on the input material.

16.   A computer output device as claimed in claim 13 or claim 14 wherein the detector is responsive to the location of at least one aperture provided at a pre-determined position in the input material.

17.   A computer output device as claimed in any one of claims 13 to 16 wherein the detector means is an optical detector.

18.   A computer output device as claimed in any one of claims 13 to 15 wherein the detector means is a magnetic detector.

19. Input material for a computer output device, the input material carrying a pattern detectable by the device, the pattern characterising an identifier which determines data to be printed on the material.

20. Input material as claimed in claim 19 comprising a pre-printed form, the pattern being a unique identifier relating to the type of form.

21.   Input material as claimed in claim 19 or claim 20 wherein the pattern is printed on the material

22.   Input material as claimed in claim 19, claim 20 or claim 21 wherein the pattern is a numerical bar code.

23.   Input material as claimed in claim 21 wherein the pattern is printed in a magnetised ink.

24.   Input material as claimed in claim 19 or claim 20 wherein the pattern comprises selected apertures provided in a series of aperture positions of the material.

25.   Input material as claimed in any one of claims 19 to 24 comprising a set of pre-printed forms each carrying a respective pattern identifying which form it is in the set.

26.   Input material as claimed in claim 25 comprising a series of sets of forms.

27.   Input material as claimed in claim 26 in which the pre-printed pattern includes a set number identifier.

28.   Input material for a computer output device, the input material carrying a pattern detectable by such a device, the pattern comprising a location mark.

29.   A computer output device substantially as hereinbefore described with reference to the accompanying drawings.

30.   Input material for a computer output device, the input material being substantially as hereinbefore described with reference to figure 2 of the accompanying drawings.